

1. A method for reconfiguring, from an original configuration to a new configuration, a striped logical device distributed across a plurality of physical disk drives in a disk array storage device and responsive to input-output requests from a host application, said method comprising the steps of:

- A) making a copy of the striped logical device in the original configuration concurrently with operations between the host application and the logical device in its original configuration,
- B) isolating the copy,
- C) converting the logical device to its new configuration whereby the host application thereafter can interact with the logical device in its new configuration,
- D) transferring data from the isolated copy to corresponding locations according to the new configuration concurrently with operations between the host application and the logical device in its new configuration, and
- E) responding to an input-output request from the host application for non-transferred data according to the new configuration by transferring data from a corresponding location in the copy to location in the

25 logical device identified by the input-output
 request.

2. A method as recited in claim 1 wherein the data processing system includes other physical disk drives and the step of making a copy of the striped logical device includes the steps of:

- 5 i) generating for the logical device a first list
 of all data locations on the physical disk
 drives according to the original configuration,
 and
 ii) replicating the data in the logical device onto
10 the other physical disk devices according to the
 original configuration.

3. A method as recited in claim 2 wherein said step of converting the logical device to its new configuration includes:

- 5 i) generating a second list of all data locations
 on the physical disk drives that are to receive
 data from the original configuration according
 to the new configuration, and
 ii) generating the new configuration whereby host
10 requests are directed to the storage locations
 as established by the second configuration.

4. A method as recited in claim 3 wherein said transferring step includes iteratively transferring data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in the first list.
5. A method as recited in claim 4 wherein said response to an input-output request includes transferring the data according to the second configuration and information on the second list.
6. A method as recited in claim 1 wherein the data processing system includes other physical disk drives and wherein:
 - A) the step of making a copy of the striped logical device includes the steps of:
 - i) generating for the logical device a first list of all data locations on the physical disk drives according to the original configuration, and
 - ii) replicating the data in the logical device onto the other physical disk devices according to the original configuration;

B) said step of converting the logical device to its new configuration includes:

i) generating a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, and

ii) generating the new configuration whereby host requests are directed to the storage locations as established by the second configuration,

C) said data copying step includes iteratively transferring data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in the first list, and

D) said response to an input-output request includes transferring the data according to the second configuration and information on the second list.

7. A method as recited in claim 6 wherein the disk array storage device includes a cache memory for storing data from the host application temporarily before transfer to a physical disk drive, said method additionally including the steps of:

- A) generating a third list of all data in the cache memory to be transferred to the physical disk drives when said conversion occurs, and
- B) transferring the data from the cache memory to the replicated data according to its first configuration data location and in response to the third list.

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- 8. A method as recited in claim 7 wherein a different process controls each of said transferring steps, said processes operating concurrently.
- 9. A method as recited in claim 7 wherein a different process controls each of said transferring steps and wherein said processes operate concurrently and independently of the operation of the host application.
- 10. A data store in which a striped logical device distributed across a plurality of physical disk drives in the disk array storage device in an original configuration can be reconfigured to a new configuration concurrently with and transparently to the processing of input-output requests from a host application, said data store comprising:
 - A) copying means for making a copy of the striped logical device in the original configuration concurrently with operations between the host

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- 10 application and the logical device in its original
configuration,
- B) means for isolating the copy,
- C) means for converting the logical device to its new
15 configuration whereby the host application thereafter
can interact with the logical device in its new
configuration,
- D) first transfer means for transferring data from the
isolated copy to corresponding locations according to
the new configuration concurrently with operations
20 between the host application and the logical device
in its new configuration, and
- E) second transfer means for responding to an input-
output request from the host application for non-
transferred data according to the new configuration
25 by transferring data from a corresponding location in
the copy to location in the logical device identified
by the input-output request.

11. A data store as recited in claim 10 additionally includes
other physical disk drives wherein said copying means
includes a first list of all data locations on the
physical disk drives according to the original
5 configuration, said copy means replicating the data in the

logical device onto the other physical disk devices according to the original configuration.

- 5 12. A data store as recited in claim 11 wherein said conversion means includes a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, said conversion means generating the new configuration whereby host requests are directed to the storage locations as established by the second configuration.
- 5 13. A data store as recited in claim 12 wherein said first transfer means includes means for iteratively transferring data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in said first list.
14. A data store as recited in claim 13 wherein said second transfer means includes means responsive to information on said second list.
15. A data store as recited in claim 10 additionally including other physical disk drives wherein:

- 5 A) said copying means includes a first list of all data
 locations on the physical disk drives according to
 the original configuration,
- B) said conversion means includes a second list of all
 data locations on the physical disk drives that are
 to receive data from the original configuration
 according to the new configuration,
- 10 C) said first transfer means includes means for
 iteratively transferring data from the other physical
 disk drives to a corresponding physical disk drive
 location according to the new configuration in
 response to information in said first list, and
- 15 D) said second transfer means includes means responsive
 to information on said second list.

16. A data store as recited in claim 15 wherein the disk array
 storage device includes a cache memory for storing data
 from the host application temporarily before transfer to a
 physical disk drive, said data store additionally
5 including:

- A) a third list of all data in the cache memory to be
 transferred to the physical disk drives, and
- B) third transfer means for transferring the data from
 the cache memory to the replicated data according to

10 its first configuration data location and information
 in said third list.

17. A data store as recited in claim 16 wherein said copying means and said first, second and third transfer means operate concurrently.
18. A method as recited in claim 16 wherein said copying means and said first, second and third transfer means operate concurrently with each other and operate concurrently and independently of a host application.
19. A data store in which a striped logical device distributed across a plurality of physical disk drives in the disk array storage device in an original configuration can be reconfigured to a new configuration concurrently with and
5 transparently to the processing of input-output requests from a host application, said data store comprising:
- A) a plurality of additional physical disk drives that replicate the data of the striped logical device in the original configuration concurrently with
10 operations between the host application and the logical device in its original configuration,
- B) a control that isolates the replicated copy,

- 15 C) a configuration file that defines the logical device
in its new configuration and enables the host
application to interact with the logical device in
its new configuration,
- 20 D) a data transfer background process that transfers
data from the isolated copy to corresponding
locations according to the new configuration
concurrently with operations between the host
application and the logical device in its new
configuration, and
- 25 E) an input-output request handler that responds to an
input-output request from the host application for
non-transferred data according to the new
configuration by transferring data from a
corresponding location in the copy to location in the
logical device identified by the input-output
request.

20. A data store as recited in claim 19 additionally includes
a first list of all data locations on the physical disk
drives according to the original configuration, said
plurality of additional physical disk drives replicating
5 the data in the logical device onto the other physical
disk devices according to the original configuration.

21. A data store as recited in claim 20 additionally comprising a second list of all data locations on the physical disk drives that are to receive data from the original configuration.
22. A data store as recited in claim 21 wherein said data transfer background process iteratively transfers data from the other physical disk drives containing the replicated data to a corresponding physical disk drive location according to the original configuration and information in said first list.
23. A data store as recited in claim 22 wherein said input-output request handler responds to information on said second list.
24. A data store as recited in claim 19 additionally including other physical disk drives wherein:
 - A) a first list of all data locations on the physical disk drives according to the original configuration;
 - B) a second list of all data locations on the physical disk drives that are to receive data from the original configuration according to the new configuration, said data transfer background process iteratively transferring data from the other physical

10 disk drives containing the replicated data to a
 corresponding physical disk drive location according
 to the original configuration and information in said
 first list and said second input-output request
 handler being responsive to information on said
15 second list.

25. A data store as recited in claim 24 wherein the disk array
 storage device includes a cache memory for storing write
 pending data from the host application temporarily before
 transfer to a physical disk drive, said data store
5 additionally including a third list of all data in the
 cache memory to be transferred to the physical disk drives
 and a pending split background process that transfers data
 from the cache memory to the replicated data according to
 its first configuration data location and the information
10 on the third list.

26. A data store as recited in claim 25 wherein said copying
 means and said data transfer and write pending background
 processes and said input-output request handler operate
 concurrently.

27. A method as recited in claim 25 wherein said copying means
 and said data transfer and write pending background

processes and said input-output request handler means
operate concurrently with each other and operate
concurrently and independently of a host application.

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